

Photometric and Electrical Measurement and Test Report for **LED GROUP ROBUS**

Room 1804-1810, East Block Huaxin Building, 2 Shuiyin Road, Yuexiu District, Guangzhou City

April 07, 2013

Product Name:	Down light
Model No:	R25230DL-01
Test Engineer:	David Zhang 
Report No.:	BTR66.181.13.523.01-1
Sample Received Date:	April 03, 2013
Test Performed Date:	April 03, 2013 to April 07, 2013
Reviewed By:	Steven Hsu 
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

Applicant	:	LED GROUP ROBUS
Product Name	:	Down light
Model No	:	R25230DL-01
Brand	:	ROBUS
Nominal Operation Voltage	:	AC 220V-240V/60Hz
Nominal Power	:	25W
Nominal CCT	:	4000K
Nominal CRI	:	84
Nominal Lumen Output	:	1800 Lumens
Nominal Life Time	:	35000 Hours
Number of hours operated prior to measurement for new sample	:	0 Hours
Stabilization Time	:	1.5 hours
Total operating time for measurement include stabilization time	:	3.5 hours
Date of Receiving Sample	:	April 03, 2013
Measurement quantities measured	:	1 pcs
Test Requested	:	1. Electrical and Photometric Test 2. Luminous Intensity Distribution Test;

1.2 Objective

The following test report is prepared on behalf of LED GROUP ROBUS use the following American National Standards or illumination Engineering Society of North America test guides:

- ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products;
- ANSI C79.1- 2002: American National Standard for Electric Lamps – Nomenclature for Glass Bulbs Intended for Use with Electric Lamps;
- ANSI C78.20 – 2003: American National Standard for Electric Lamps – A, G, PS, and Similar Shapes with E26 Medium Screw Bases;
- ANSI C78.21 – 2003: American National Standard for Electric Lamps – PAR and R Shapes;
- ANSI C78.24 – 2001: American National Standard for Electric Lamps – Two-inch (51 mm); Integral-reflector Lamps with Front Covers and GU5.3 or GX 5.3 Bases;
- ANSI/IEC C81.61-2003: American National Standard for Electric Lamp Bases;
- ANSI/IEEE C62.41 – 1991 (01-May-1991): Surge Voltages in Low-Voltage AC Power Circuits, Recommended Practice for;
- CIE Publication No. 13.3 – 1995: Method of Measuring and Specifying Color Rendering of Light Sources;
- CIE Publication No. 18.2 – 1983: The Basis of Physical Photometry;
- IESNA LM-16-1993: Practical Guide to Colorimetry of Light Sources;
- IESNA LM-28-89 – 1989: Guide for the Selection, Care, and Use of Electrical Instruments in the Photometric Laboratory;
- IESNA LM-79-08 Electrical and Photometric Measurement of Solid State Lighting Products
- UL 1993 – 1999: Standard for Self-Ballasted Lamps and Lamp Adapters;
- UL 8750 – 2009: Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.3 Test Facility Description

The Energy Efficiency Lab used by BEST to collect energy efficiency measurement data is located in 1st Floor, 1st Building, Weitai Industrial Park, Yingrenshi, Shiyao, Baoan, Shenzhen, China. BEST Test Service Shenzhen Co., Ltd is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200770-0). BEST Test Service Shenzhen Co., Ltd is also an ELI accredited lab for lighting products (ELI Certificate No. ELI-L04-2010) and UL accredited lab for lighting products

1.4 Test Equipment List

Device	Manufacture	Model No	Serial No	Cal. Date	Cal Due Date
Integral Sphere	Everfine	1.5M SPEKTRON	608040T	Oct 20, 2012	Oct 20, 2013
Integral Sphere	Everfine	1.5M SPEKTRON	906025	Oct 20, 2012	Oct 20, 2013
Integral Sphere	Labsphere	LMS-650	6101002416	Mar 10, 2013	Mar 09, 2014
Spectro Meter Assy	Labsphere	CDS 2100	217101416	Mar 10, 2013	Mar 09, 2014
Plus UV-VIS-Near IR Spectrophotometer Colorimeter	Everfine	PMS-80-V1 (380nm-800nm)	608033	Oct 20, 2012	Oct 20, 2013
Plus UV-VIS-Near IR Spectrophotometer Colorimeter	Everfine	PMS-700 (200nm-800nm)	908001	Oct 20, 2012	Oct 20, 2013
Goniophotometer	Everfine	GOR-5000	1009001	Nov 20, 2012	Nov 19, 2013
6 ^{1/2} Digital Multimeter	Agilent	34401A	MY4702386	Oct 18, 2012	Oct 17, 2013
AC Power Source	California Instrument	1501I	S13093	N/A	N/A
AC Power Source	California Instrument	1501L	L03572	N/A	N/A
Standard Light Source	OSRAM	24V/50W	NO.1	Sep 17, 2012	Sep 16, 2013
Standard Light Source	OSRAM	24V/50W	NO.2	Sep 17, 2012	Sep 16, 2013
Multi-Function AC standard Meter	Everfine	PF2010S	605010	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	Everfine	PF9811	902029	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310009	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310017	Oct 18, 2012	Oct 17, 2013
Digital Power Meter	YOKOGAWA	WT210	91K310016	Oct 18, 2012	Oct 17, 2013
Ballast Parameter Analyzer	Everfine	PF9821	905050	Oct 18, 2012	Oct 17, 2013
Second Meter	TIANFU	PC 396	N/A	Oct 18, 2012	Oct 17, 2013
Digital Storage Oscilloscope	Tektronix	TDS2012B	C051911	Oct 18, 2012	Oct 17, 2013

Statement of Traceability: BEST Test Service Shenzhen Co., Ltd. certifies that all calibration has been performed using suitable standards traceable to the NIM China.

2 - Test Method

2.1 Photometric and Electrical Measurement (Integrated Sphere Method)

Total light output (luminous flux) for the $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ambient temperature conditions is measured using an Everfine integrating sphere. Temperature is measured at a position inside the sphere. Spectral radiant flux measurements are made using PMS-80-V1 to the detector port of the integrating sphere. Each lamp is operated at rated voltage in its designated orientation. Each lamp should be stable before measurements are made. The determining method of stable is as follows:

Step 1 Take 3 measurements of the lamp light output at 15 minute interval (total time=30mintues.)This time period is in addition to the recommended pre-burning time.

Step 2 Calculate the percent difference between the maximum measured value and the minimum measured value for the three consecutive measurements.

Step 3 if the value calculated in Step 2 does not exceed 0.5 percent, the lamp is considered stable.

Luminous flux, chromaticity coordinates, correlated color temperature and color rendering index for each lamp are calculated from the spectral radiant flux measurements taken at 2 nm intervals over the range 350 to 1050 nm. The calibration of the sphere photometer-spectrometer system is traceable to the NIST USA. Lamp efficacy (lumens per watts) for each lamp model is computed based on the revised luminous flux result. Electrical measurements including voltage, current, power and power factor are measured using the YOKOGAWA WT210 digital power Meter.

The total uncertainty of the light output measurements is estimated, at the 95% confidence level, not to exceed $\pm 1.12\%$ over the wavelength range 380-800 nm.

2.2 Photometric and Electrical Measurement (GonioPhotometer Method)

Before each measurement, the method below should be used to determine the lamp is stable or not.

Step 1 Take 3 measurements of the lamp intensity at 15 minute interval (total time=30mintues.)This time period is in addition to the recommended pre-burning time.

Step 2 Calculate the percent difference between the maximum measured value and the minimum measured value for the three consecutive measurements.

Step 3 if the value calculated in Step 2 does not exceed 0.5 percent, the lamp is considered stable.

A Everfine GOR-5000 Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample; the photometric distance is 2.436m for near field, the photometric distance is 24.62meters for far field. Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to be stable before measurement was made. Electrical measurements including voltage, current, power and power factor were measured using the YOKOGAWA WT210 Power Analyzer.

Some graphics were created with Photometric Plus software.

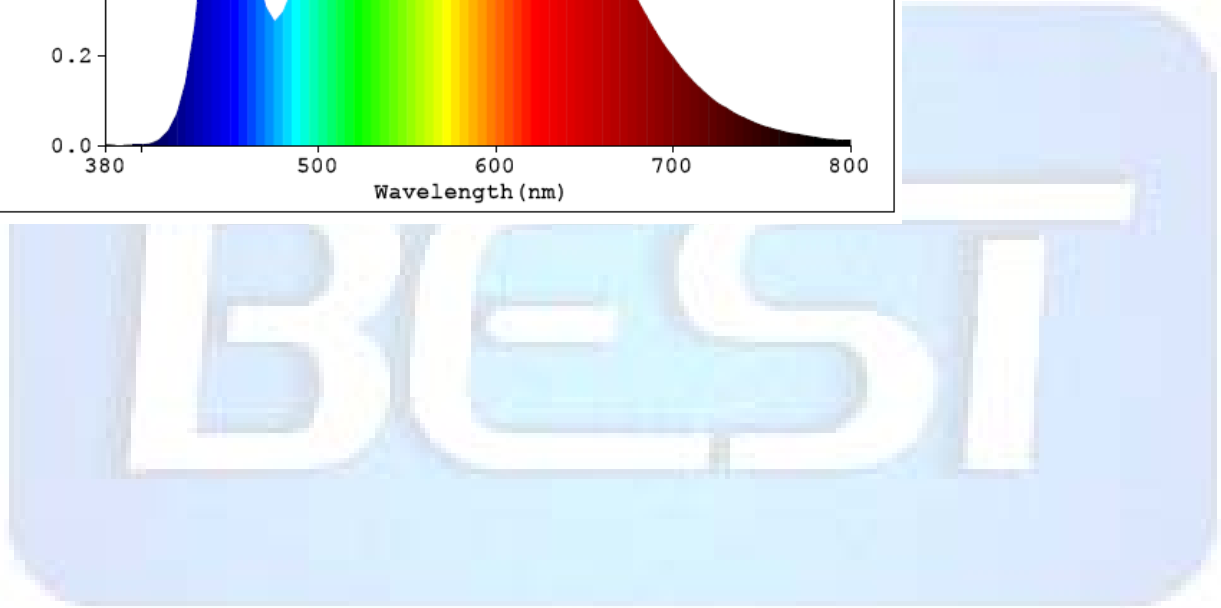
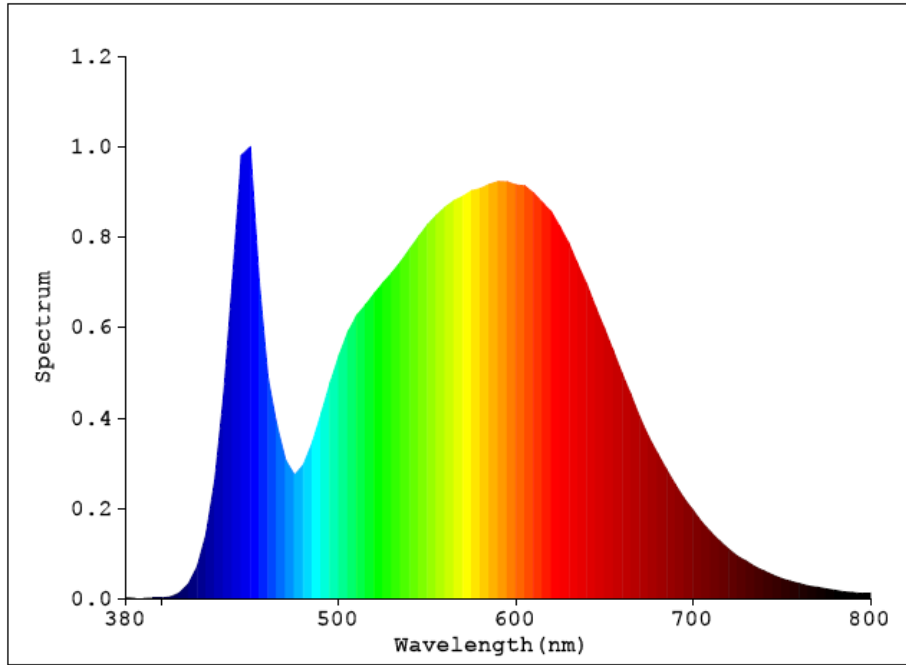
2.3 Deviation from standard operating procedure

None

3 – Summary of Test Result

	Item	Test Result		Accreditation
Required Fields	Lumen Output (Lumens)	1854.79		NVLAP/EPA
	Luminous Efficacy (lm/w)	76.80		NVLAP/EPA
	Correlated Color Temperature (CCT)	4095		NVLAP/EPA
	Color Rendering Index- CRI	85.4		NVLAP/EPA
	Input Power (W)	24.15		NVLAP/EPA
Optional Fields	Power Type	<input checked="" type="checkbox"/> AC	<input type="checkbox"/> DC	/
	Input Voltage (V)	220.0		NVLAP/EPA
	Input Current (A)	0.1199		NVLAP/EPA
	Power Factor	0.9155		NVLAP/EPA
	x(CIE 1931)	0.3774		NVLAP/EPA
	y(CIE 1931)	0.3785		NVLAP/EPA
	u' (CIE 1976)	0.2224		NVLAP/EPA
	v' (CIE 1976)	0.5019		NVLAP/EPA
	Duv(CIE 1976)	0.0017		NVLAP/EPA
	R9	29		NVLAP/EPA
	50% Beam Angle: (Degree)	107.1		NVLAP/EPA
	Center beam candlepower: (cd)	688.7		NVLAP/EPA
	Zonal lumen density (0-60°):	79.6%		NVLAP/EPA
	Zonal lumen density (60-90°):	20.4%		NVLAP/EPA
	Zonal lumen density (90-120°):	0%		NVLAP/EPA
Zonal lumen density (120-180°):	0%		NVLAP/EPA	

4 – Spectral Flux Plots



5 – EUT Photos



6 – Luminous Intensity Distribution Test Plots (IES Chromaticity)

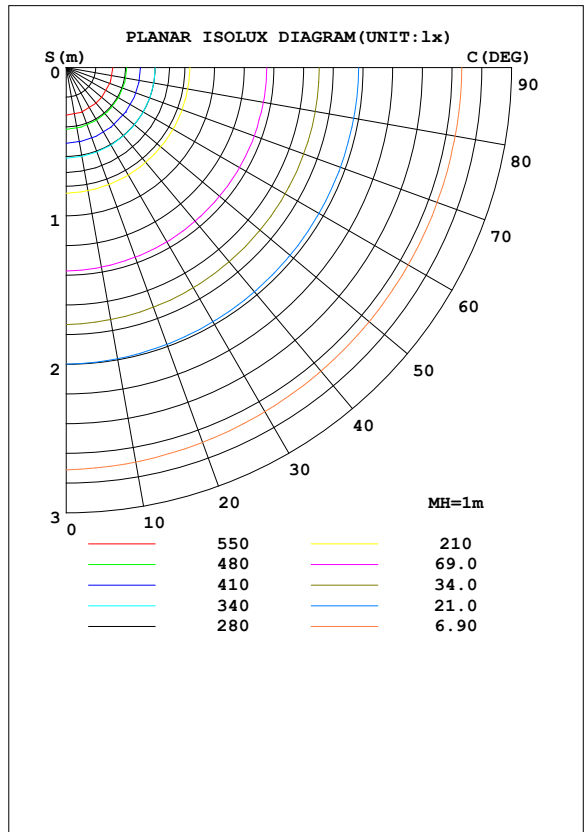
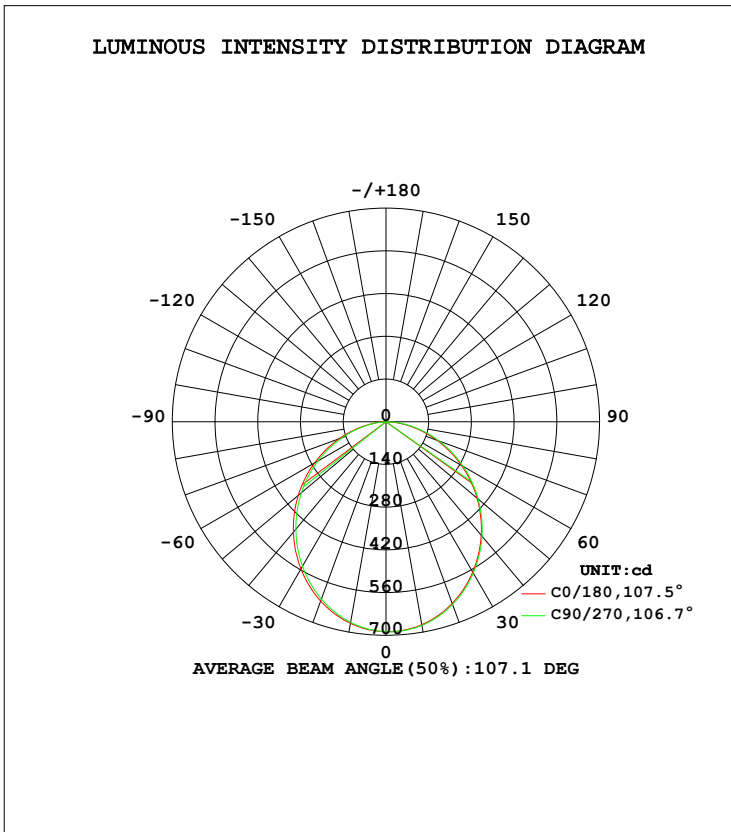
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LUMINAIRE PHOTOMETRIC TEST REPORT

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

DATA OF LAMP		PHOTOMETRIC DATA Eff: 76.80 lm/W			
MODEL	"T47452FN/23	Imax (cd)	688.7	S/MH (C0/180)	1.21
NOMINAL POWER (W)	25	LOR (%)	100.0	S/MH (C90/270)	1.19
RATED VOLTAGE (V)	220	TOTAL FLUX (lm)	1854.8	η UP, DN (C0-180)	0.0, 48.3
NOMINAL FLUX (lm)	1854.79	CIE CLASS	DIRECT	η UP, DN (C180-360)	0.0, 51.7
LAMPS INSIDE	1	η up (%)	0.0	CIBSE SHR NOM	1.25
TEST VOLTAGE (V)	220.0	η down (%)	100.0	CIBSE SHR MAX	1.35



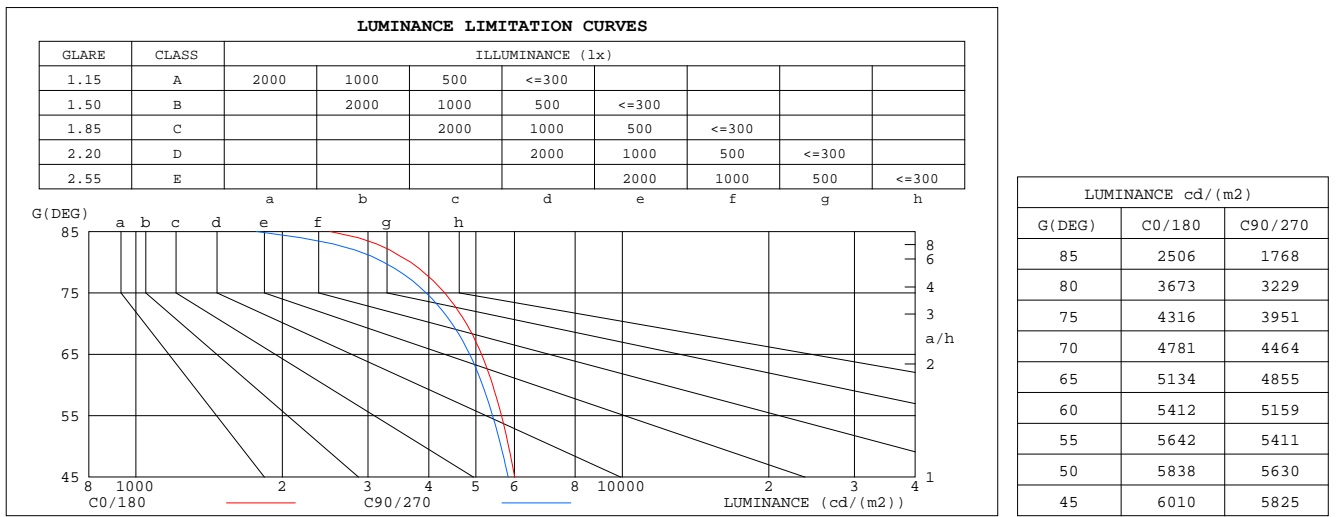
C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature: 24.3DEG
 Operators: David
 Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity: 46.4%
 Test Distance: 2.420m [K=1.0000]
 Remarks:

**ZONAL FLUX DIAGRAM
AND LUMINANCE LIMITATION CURVES**

ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	#lum,lamp
10	670.9	667.8	667.6	670.9	675.3	677.5	677.5	675.5	0- 10	64.97	64.97	3.5,3.5
20	625.6	619.1	618.7	625.2	634.0	637.4	637.3	634.1	10- 20	184.5	249.4	13.4,13.4
30	557.2	547.7	547.2	556.7	568.6	572.8	572.5	568.5	20- 30	275.3	524.7	28.3,28.3
40	472.2	460.4	459.7	471.1	485.3	489.8	489.4	485.1	30- 40	325.7	850.4	45.9,45.9
50	375.2	362.8	361.9	374.1	389.8	394.8	394.4	389.6	40- 50	331.4	1182	63.7,63.7
60	270.6	258.8	257.9	269.3	285.4	291.7	291.6	285.6	50- 60	294.0	1476	79.6,79.6
70	163.5	153.3	152.7	162.3	177.6	185.4	185.7	178.4	60- 70	220.7	1697	91.5,91.5
80	63.78	56.41	56.07	63.21	75.69	83.82	84.43	77.19	70- 80	125.2	1822	98.2,98.2
90	0.0077	0	0	0.0881	1.158	3.837	4.133	1.730	80- 90	32.91	1855	100,100
100	0	0	0	0	0	0	0	0	90-100	0.0986	1855	100,100
110	0	0	0	0	0	0	0	0	100-110	0.0001	1855	100,100
120	0	0	0	0	0	0	0	0	110-120	0	1855	100,100
130	0	0	0	0	0	0	0	0	120-130	0	1855	100,100
140	0	0	0	0	0	0	0	0	130-140	0	1855	100,100
150	0	0	0	0	0	0	0	0	140-150	0	1855	100,100
160	0	0	0	0	0	0	0	0	150-160	0	1855	100,100
170	0	0	0	0	0	0	0	0	160-170	0	1855	100,100
180	0	0	0	0	0	0	0	0	170-180	0	1855	100,100
DEG	LUMINOUS INTENSITY:cd									UNIT:lm		



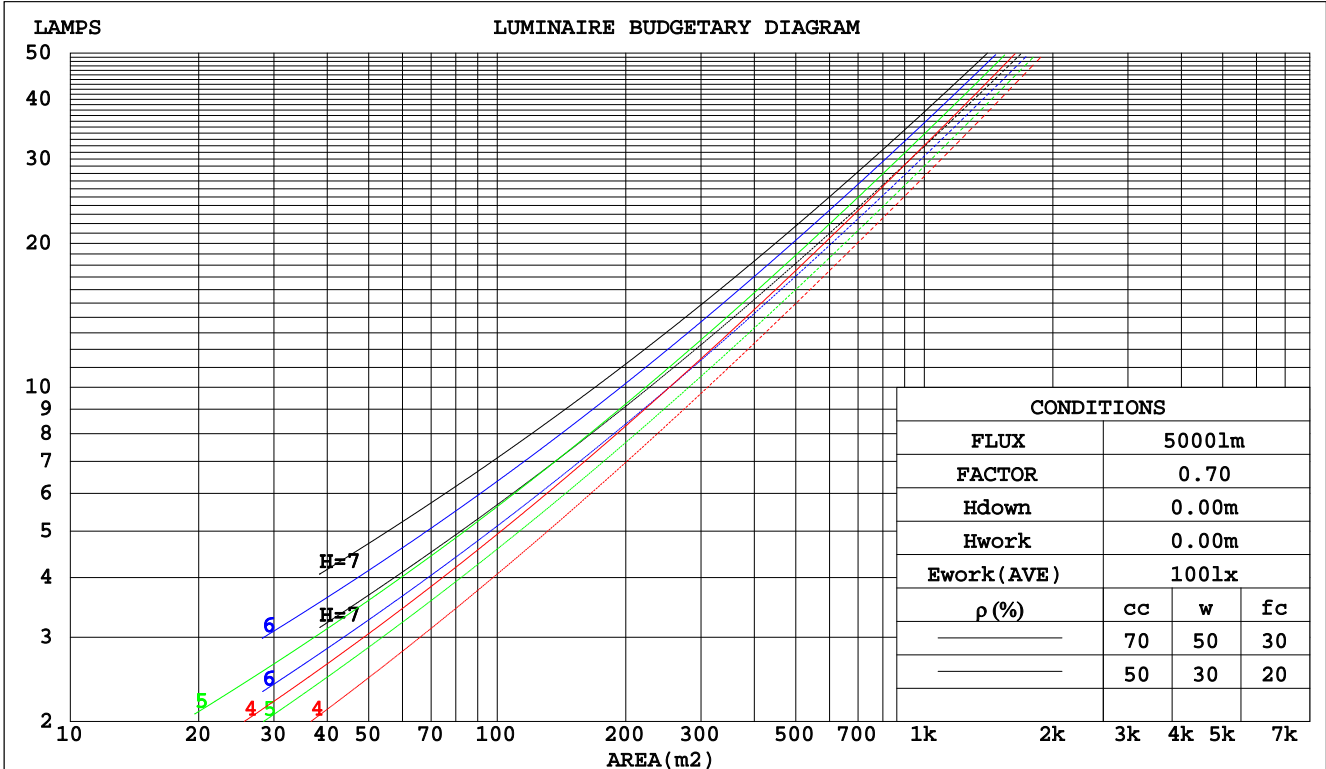
C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

CU AND LUMINAIRE BUDGETARY ESTIMATE DIAGRAM

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

pcc	80%			70%			50%			30%			10%			0
	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
pw																0
pfc	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio Coefficients of Utilization(CU)															
0.0	1.19	1.19	1.19	1.16	1.16	1.16	1.11	1.11	1.11	1.06	1.06	1.06	1.02	1.02	1.02	.00
1.0	1.04	.00	.96	1.02	.98	.94	.98	.94	.91	.94	.91	.89	.90	.88	.86	.84
2.0	.91	.84	.78	.89	.83	.77	.85	.80	.76	.82	.78	.74	.79	.75	.72	.70
3.0	.80	.72	.65	.78	.71	.65	.75	.69	.64	.73	.67	.62	.70	.65	.61	.59
4.0	.71	.62	.55	.69	.61	.55	.67	.60	.54	.65	.58	.53	.62	.57	.53	.51
5.0	.63	.54	.48	.62	.54	.47	.60	.53	.47	.58	.52	.46	.56	.51	.46	.44
6.0	.57	.48	.42	.56	.48	.42	.54	.47	.41	.53	.46	.41	.51	.45	.40	.38
7.0	.52	.43	.37	.51	.43	.37	.49	.42	.37	.48	.41	.36	.47	.41	.36	.34
8.0	.47	.39	.33	.47	.38	.33	.45	.38	.33	.44	.37	.32	.43	.37	.32	.30
9.0	.43	.35	.30	.43	.35	.30	.42	.34	.29	.41	.34	.29	.40	.34	.29	.27
10.0	.40	.32	.27	.40	.32	.27	.39	.32	.27	.38	.31	.27	.37	.31	.27	.25



C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

WEC AND CCEC

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

ρcc	80%			70%			50%			30%			10%			0
ρw	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
ρfc	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio						Wall Exitance Coefficients(WEC)									
0.0																
1.0	.305	.174	.055	.298	.170	.054	.285	.163	.052	.273	.157	.050	.262	.152	.049	
2.0	.288	.158	.048	.282	.155	.048	.270	.150	.047	.259	.145	.046	.249	.141	.044	
3.0	.267	.142	.043	.261	.140	.042	.251	.136	.041	.241	.132	.041	.233	.129	.040	
4.0	.246	.128	.038	.242	.126	.037	.233	.123	.037	.224	.120	.036	.216	.117	.036	
5.0	.228	.116	.034	.224	.115	.033	.216	.112	.033	.208	.110	.033	.201	.107	.032	
6.0	.212	.106	.030	.208	.105	.030	.201	.103	.030	.194	.101	.030	.188	.099	.029	
7.0	.197	.097	.028	.194	.097	.028	.187	.095	.027	.181	.093	.027	.176	.091	.027	
8.0	.184	.090	.025	.181	.089	.025	.175	.088	.025	.170	.086	.025	.165	.085	.025	
9.0	.173	.084	.023	.170	.083	.023	.165	.082	.023	.160	.080	.023	.155	.079	.023	
10.0	.163	.078	.022	.160	.077	.022	.155	.076	.021	.151	.075	.021	.147	.074	.021	

ρcc	80%			70%			50%			30%			10%			0
ρw	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%	0
ρfc	20%			20%			20%			20%			20%			0
RCR	RCR:Room Cavity Ratio						Ceiling Cavity Exitance Coefficients(CCEC)									
0.0	.191	.191	.191	.163	.163	.163	.111	.111	.111	.064	.064	.064	.020	.020	.020	
1.0	.180	.156	.135	.154	.134	.116	.105	.092	.080	.061	.053	.047	.019	.017	.015	
2.0	.172	.132	.099	.147	.114	.085	.101	.079	.059	.058	.046	.035	.019	.015	.011	
3.0	.164	.114	.075	.141	.099	.065	.096	.069	.045	.056	.040	.027	.018	.013	.009	
4.0	.156	.101	.059	.134	.087	.051	.092	.061	.036	.053	.036	.021	.017	.012	.007	
5.0	.149	.091	.048	.128	.078	.041	.088	.055	.029	.051	.032	.017	.016	.010	.006	
6.0	.142	.082	.039	.122	.071	.034	.084	.050	.024	.049	.029	.014	.016	.010	.005	
7.0	.135	.075	.033	.116	.065	.029	.080	.046	.021	.047	.027	.012	.015	.009	.004	
8.0	.128	.069	.029	.111	.060	.025	.076	.042	.018	.044	.025	.011	.014	.008	.004	
9.0	.122	.064	.025	.105	.056	.022	.073	.039	.016	.043	.023	.009	.014	.008	.003	
10.0	.117	.060	.023	.101	.052	.020	.070	.037	.014	.041	.022	.008	.013	.007	.003	

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Uncorrected UGR Table

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm										
NAME:					TYPE:T47452FN/23			WEIGHT:		
DIM.:					SPEC.:			SERIAL No.:		
MFR.: LED GROUP ROBUS					SUR.:			PROTECTION ANGLE:		
ceiling/cavity	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
walls	0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimensions	Viewed crosswise					Viewed endwise				
x = 2H y = 2H	18.6	20.1	18.9	20.3	20.5	18.5	20.0	18.7	20.2	20.4
3H	20.1	21.4	20.4	21.7	21.9	19.8	21.2	20.1	21.4	21.7
4H	20.6	21.9	20.9	22.2	22.4	20.3	21.6	20.6	21.9	22.1
6H	21.0	22.2	21.3	22.5	22.8	20.6	21.9	21.0	22.1	22.4
8H	21.1	22.3	21.4	22.5	22.8	20.7	21.9	21.0	22.2	22.5
12H	21.1	22.2	21.4	22.5	22.8	20.7	21.9	21.0	22.1	22.5
4H 2H	19.2	20.5	19.5	20.7	21.0	19.0	20.3	19.3	20.6	20.9
3H	20.8	21.9	21.1	22.2	22.5	20.6	21.7	20.9	22.0	22.3
4H	21.4	22.5	21.8	22.8	23.1	21.2	22.2	21.5	22.5	22.9
6H	21.9	22.8	22.3	23.2	23.5	21.6	22.5	22.0	22.9	23.2
8H	22.0	22.9	22.4	23.3	23.7	21.7	22.6	22.1	22.9	23.3
12H	22.1	22.9	22.5	23.3	23.7	21.7	22.5	22.1	22.9	23.3
8H 4H	21.6	22.5	22.0	22.9	23.2	21.4	22.3	21.8	22.6	23.0
6H	22.2	22.9	22.6	23.3	23.8	21.9	22.6	22.4	23.1	23.5
8H	22.4	23.0	22.9	23.5	23.9	22.1	22.7	22.5	23.2	23.6
12H	22.5	23.1	23.0	23.5	24.0	22.1	22.7	22.6	23.1	23.6
12H 4H	21.6	22.4	22.0	22.8	23.2	21.4	22.2	21.8	22.6	23.0
6H	22.2	22.9	22.7	23.3	23.7	22.0	22.6	22.4	23.0	23.5
8H	22.5	23.0	22.9	23.5	23.9	22.1	22.7	22.6	23.1	23.6
Variations with the observer position at spacings:										
S = 1.0H	+ 0.2 / - 0.2					+ 0.2 / - 0.2				
1.5H	+ 0.2 / - 0.3					+ 0.2 / - 0.3				
2.0H	+ 0.3 / - 0.3					+ 0.3 / - 0.3				

CIE Pub.117 Corrected 1855 lm Total Lamp Luminous Flux.(8log(F/F0) = 2.1)

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

UTILIZATION FACTORS TABLE

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

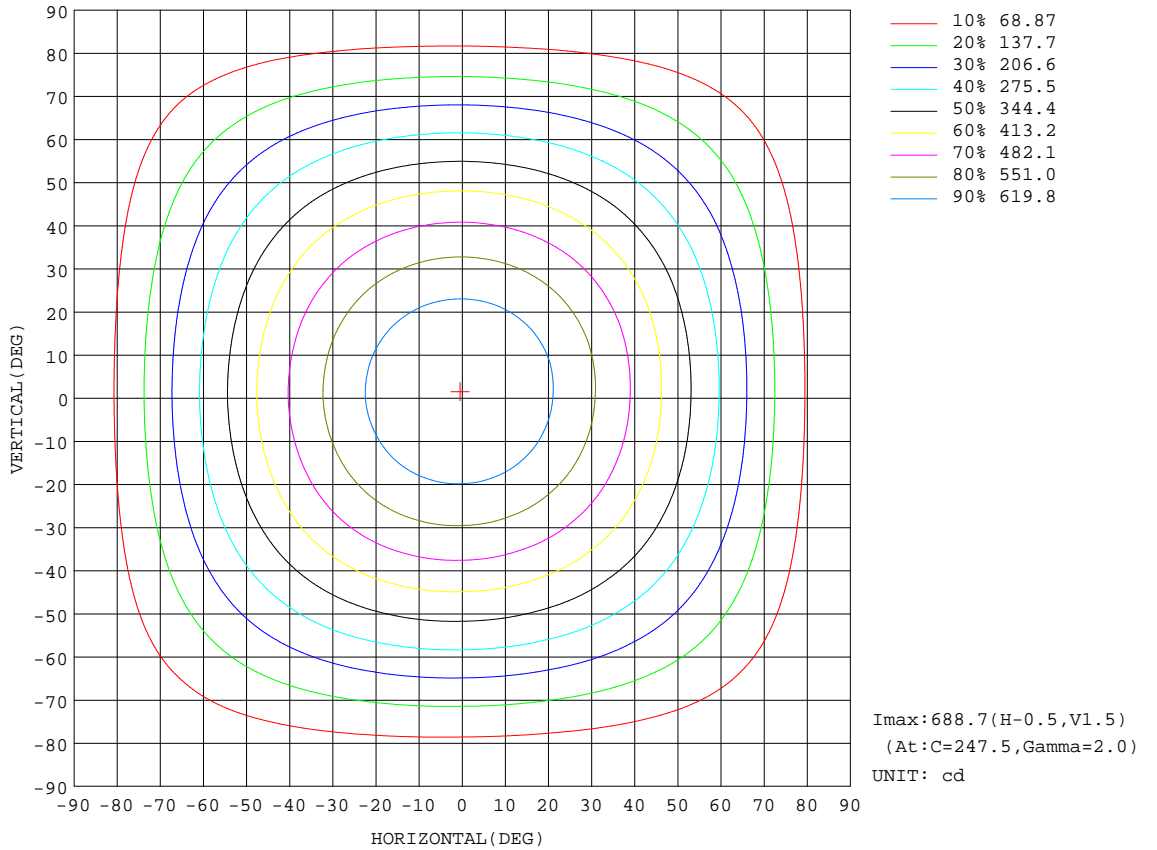
REFLECTANCE										
Ceiling	0.8	0.8	0.8	0.7	0.7	0.7	0.5	0.5	0.5	0
Walls	0.7	0.5	0.3	0.7	0.5	0.3	0.7	0.5	0.3	0
Working plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
ROOM INDEX	UTILIZATION FACTORS(PERCENT) $k(RI) \times RCR = 5$									
k = 0.60	58	47	40	57	47	40	56	46	40	33
0.80	68	57	49	67	56	49	65	56	49	42
1.00	77	66	58	75	65	58	73	66	58	51
1.25	84	73	66	82	73	66	80	71	65	58
1.50	89	79	72	87	78	71	84	76	70	63
2.00	95	87	81	94	86	80	90	84	78	71
2.50	99	92	86	97	90	85	93	88	83	75
3.00	103	96	90	100	94	89	96	91	87	79
4.00	106	101	96	104	99	95	100	96	92	83
5.00	109	104	100	106	102	99	102	99	95	86
ROOM INDEX	UF(total)									Direct
According to DIN EN 13032-2 2004			Suspended				SHRNOM = 1.25			

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

ISOCANDELA DIAGRAM

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:

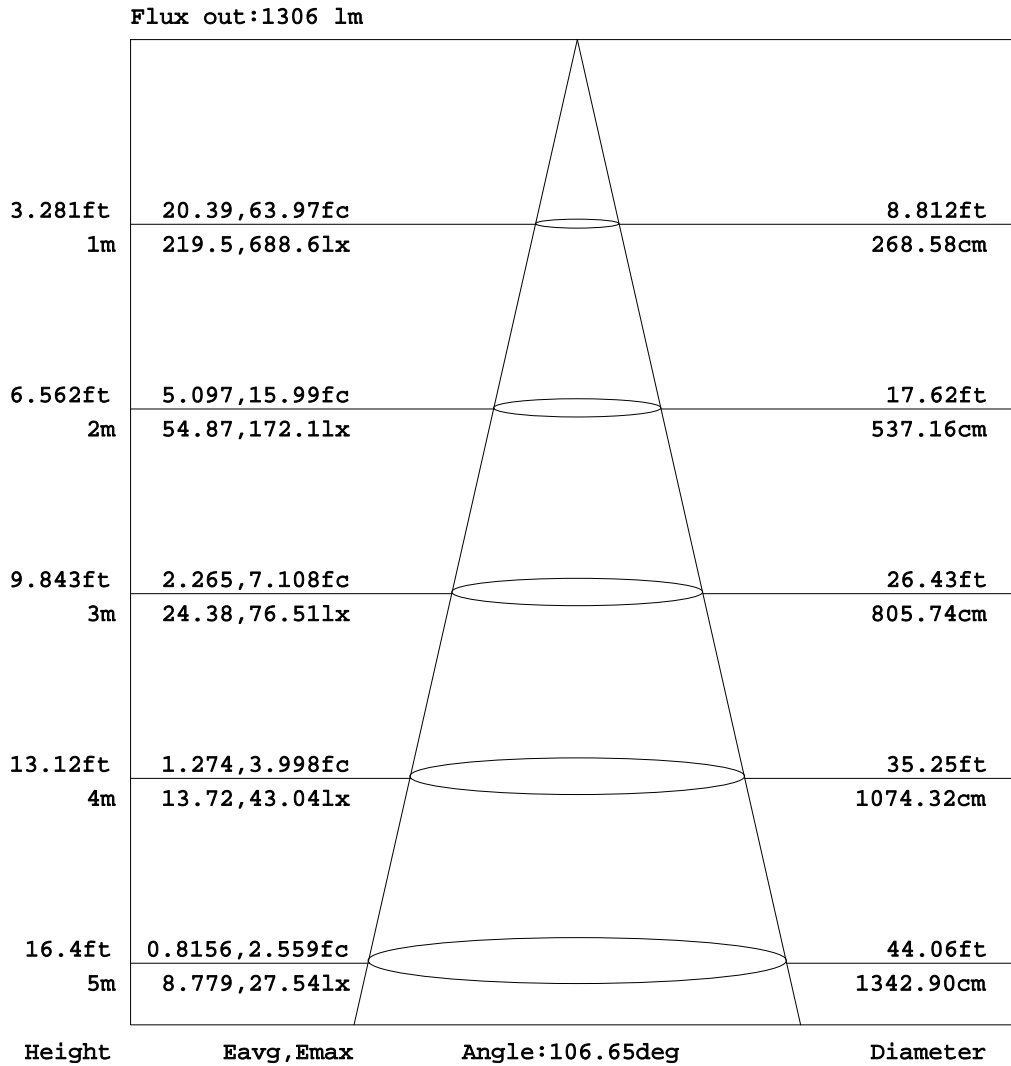


C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature: 24.3DEG
 Operators: David
 Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity: 46.4%
 Test Distance: 2.420m [K=1.0000]
 Remarks:

AAI Figure

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: LED GROUP ROBUS	SUR.:	PROTECTION ANGLE:



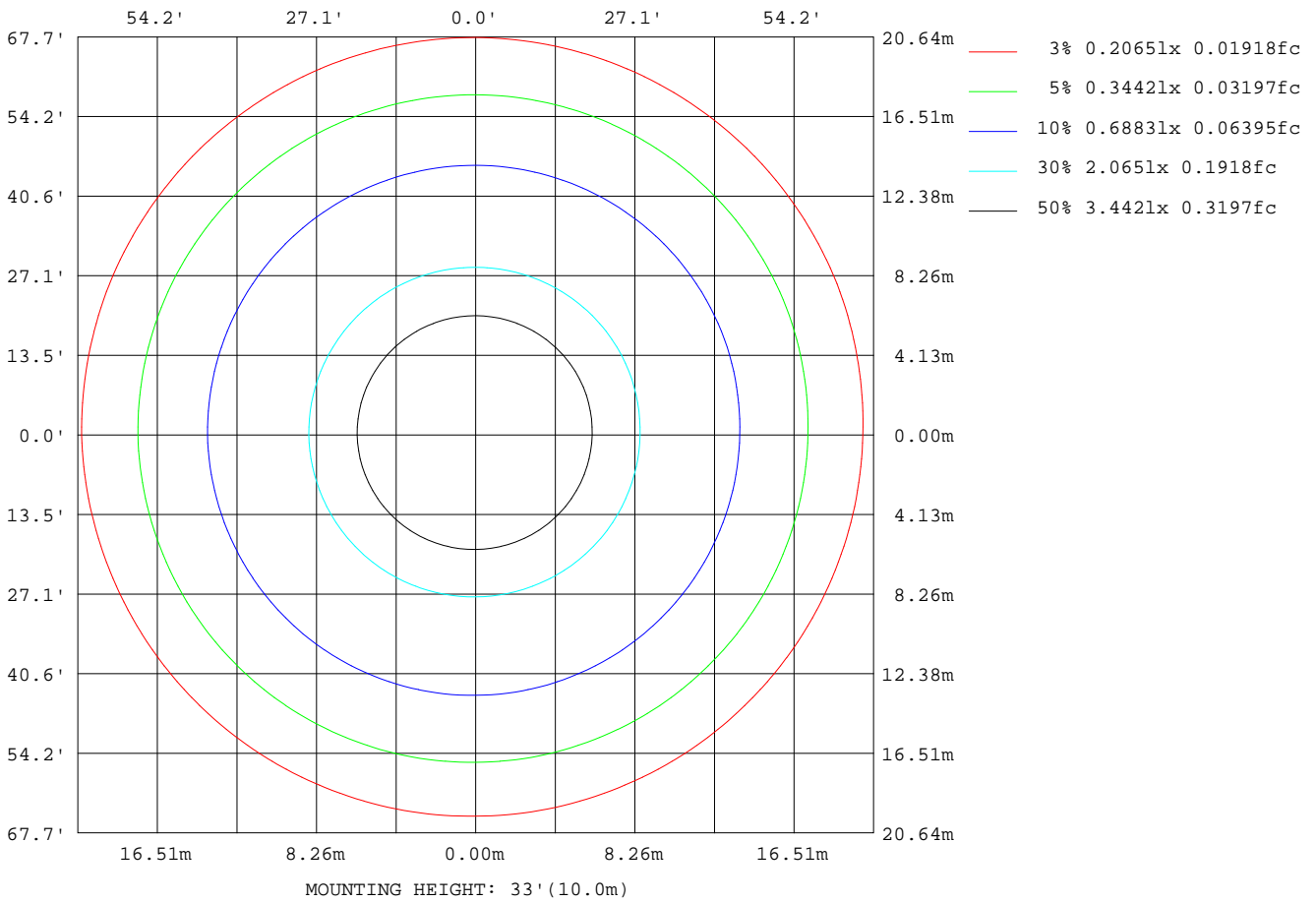
Note:The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

ISOLUX DIAGRAM

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.:NGF"ITQWR"TDWU""	SUR.:	PROTECTION ANGLE:



C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Average Luminance Table (CIBSE)

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: NGF"ITQWR"TDWU""	SUR.:	PROTECTION ANGLE:

Parameter description for average Luminance	Symbol	Value	Unit
Luminance in Azimuth Plane	Bc	refer Table 2	cd/sq.m.
Intensity at angle Gamma in given azimuth plane	I	from data	cd/klm
Number of lamps	N	1	
Output of each lamp(initial lumens as specified)	F	1854.79	lm
Multiplying factor	K	1	
Luminous area in horizontal plane used in calculations	A	0.1	sq.m.
Angle to the downward vertical from light centre	Gamma	from data	deg

Table 1. Calculation parameters for determination of CIBSE LG3:1996 Average Luminance

G deg	C plane(deg)																		
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
55	5642	5654	5662	5664	5664	5664	5668	5675	5686	5702	5721	5744	5770	5797	5821	5843	5865	5889	5902
60	5412	5426	5437	5441	5443	5447	5454	5464	5478	5496	5518	5542	5569	5596	5622	5646	5669	5693	5707
65	5134	5152	5166	5172	5175	5182	5195	5211	5230	5251	5277	5304	5332	5359	5385	5408	5433	5460	5476
70	4781	4803	4822	4834	4845	4858	4875	4896	4920	4947	4977	5008	5039	5069	5096	5119	5144	5174	5193
75	4316	4347	4374	4394	4412	4434	4461	4492	4524	4558	4595	4633	4668	4700	4725	4746	4772	4810	4834
80	3673	3717	3758	3795	3830	3863	3899	3940	3992	4045	4096	4143	4184	4219	4244	4261	4287	4330	4359
85	2506	2572	2644	2726	2809	2882	2943	3010	3091	3173	3242	3309	3386	3459	3506	3529	3566	3637	3686

Table 2. Average Luminance(cd/sq.m.) for defined C plane,Gamma angle

CIBSE Category	Gamma (deg)	Average Luminance		Patch Luminance	
		maximum	specified	maximum	specified
		calculated	maximum	measured	maximum
Category 1	55 to 90	5902	200	---	500
Category 2	65 to 90	5476	200	---	500
Category 3	75 to 90	4834	200	---	500

Table 3. Tabulation of Average and Patch Luminance(cd/sq.m.) for defined CIBSE categories

No match

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Average Luminance Table (CIBSE)

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: NGF"ITQWR"TDWU""	SUR.:	PROTECTION ANGLE:

Parameter description for average Luminance	Symbol	Value	Unit
Luminance in Azimuth Plane	Bc	refer Table 2	cd/sq.m.
Intensity at angle Gamma in given azimuth plane	I	from data	cd/klm
Number of lamps	N	1	
Output of each lamp(initial lumens as specified)	F	1854.79	lm
Multiplying factor	K	1	
Luminous area in horizontal plane used in calculations	A	0.1	sq.m.
Angle to the downward vertical from light centre	Gamma	from data	deg

Table 1. Calculation parameters for determination of CIBSE LG3:2001 Average Luminance

G deg	C plane(deg)																		
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
55	5642	5654	5662	5664	5664	5664	5668	5675	5686	5702	5721	5744	5770	5797	5821	5843	5865	5889	5902
60	5412	5426	5437	5441	5443	5447	5454	5464	5478	5496	5518	5542	5569	5596	5622	5646	5669	5693	5707
65	5134	5152	5166	5172	5175	5182	5195	5211	5230	5251	5277	5304	5332	5359	5385	5408	5433	5460	5476
70	4781	4803	4822	4834	4845	4858	4875	4896	4920	4947	4977	5008	5039	5069	5096	5119	5144	5174	5193
75	4316	4347	4374	4394	4412	4434	4461	4492	4524	4558	4595	4633	4668	4700	4725	4746	4772	4810	4834
80	3673	3717	3758	3795	3830	3863	3899	3940	3992	4045	4096	4143	4184	4219	4244	4261	4287	4330	4359
85	2506	2572	2644	2726	2809	2882	2943	3010	3091	3173	3242	3309	3386	3459	3506	3529	3566	3637	3686

Table 2. Average Luminance(cd/sq.m.) for defined C plane,Gamma angle

range (deg)	Maximum measured	Average Luminance(cd/sq.m)			
		Maximum limit for screen type & software category used			
		Type I,II screen Some neg.s'ware	Type I,II screen Only pos.s'ware	Type III screen Some neg.s'ware	Type III screen Only pos.s'ware
55 to 90	5902	1000	1500	200	500
65 to 90	5476	1000	1500	200	500

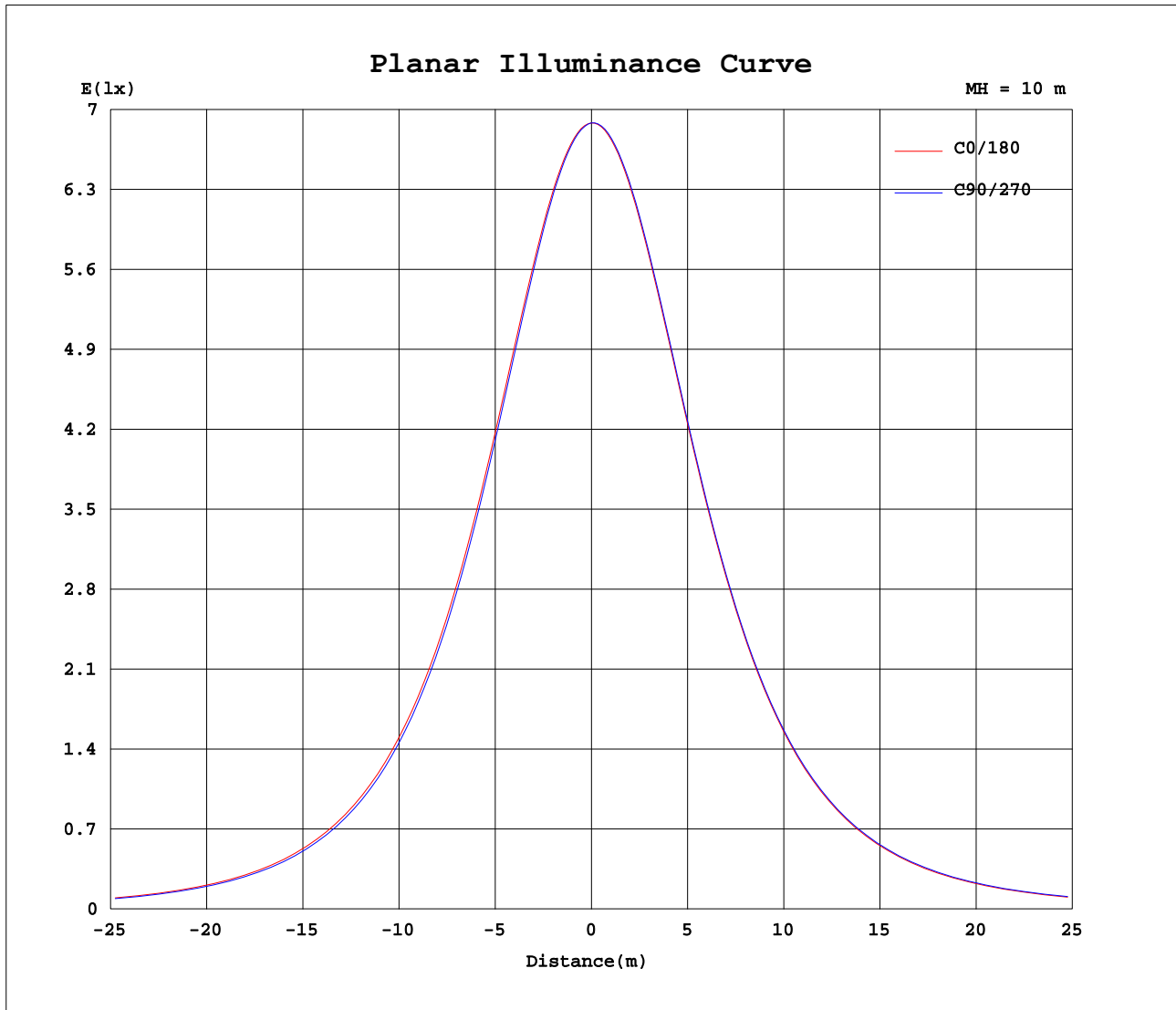
Table 3. Tabulation of average luminance(cd/sq.m.) and luminance limits

No match

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

Planar Illuminance Curve



C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature: 24.3DEG
 Operators: David
 Test Date: 2013-04-07

γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System: EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity: 46.4%
 Test Distance: 2.420m [K=1.0000]
 Remarks:

LUMINOUS DISTRIBUTION INTENSITY DATA

Test:U:220.0V I:0.1199A P:24.15W PF:0.9155 Lamp Flux:1854.79x1 lm		
NAME:	TYPE:T47452FN/23	WEIGHT:
DIM.:	SPEC.:	SERIAL No.:
MFR.: NGF"ITQWR"TDWU""	SUR.:	PROTECTION ANGLE:

Table--1

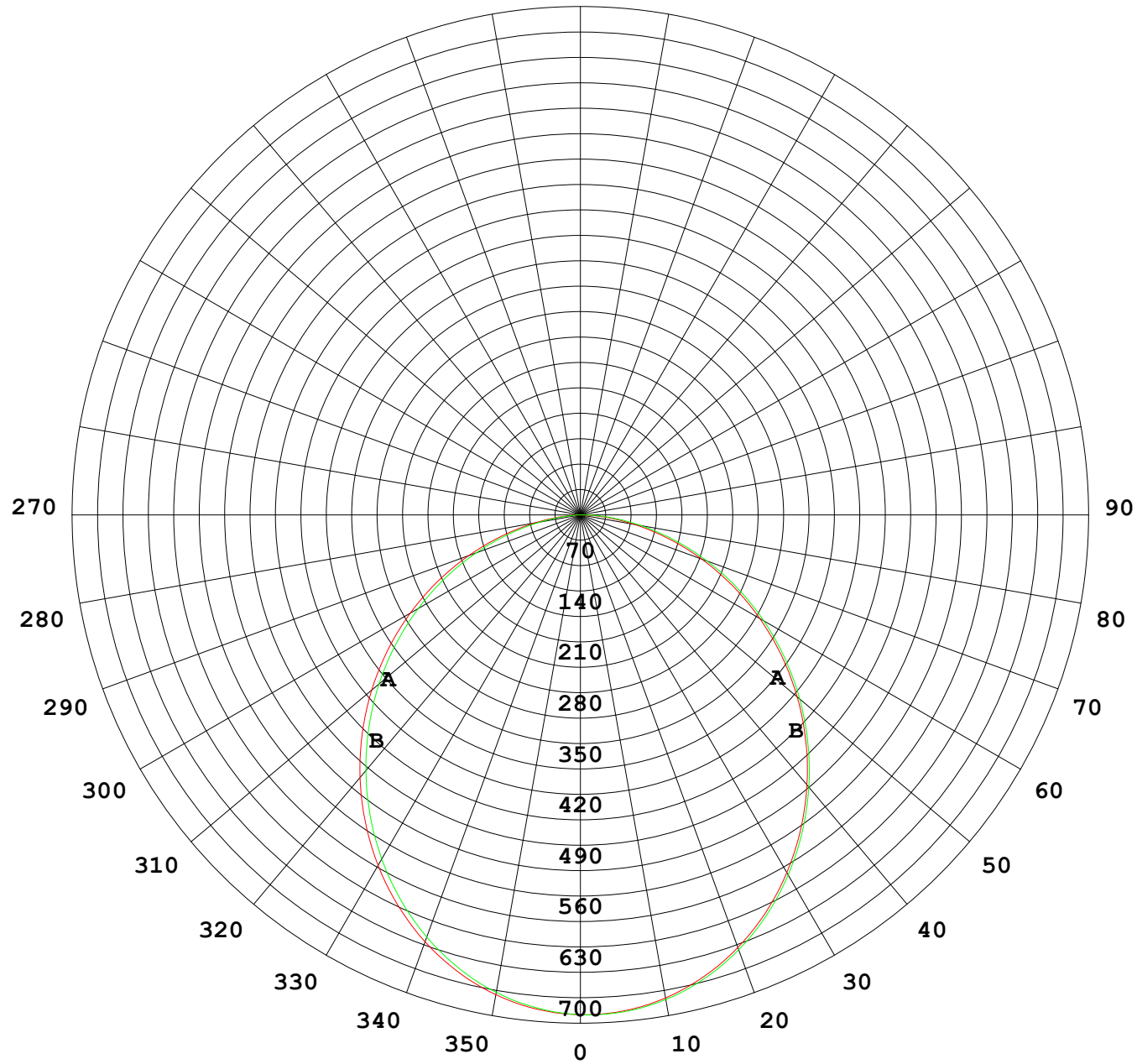
UNIT: cd

C (DEG) \ γ (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338			
0	688	688	688	688	688	688	688	689	688	688	688	688	688	688	688	689			
5	683	682	682	682	682	683	683	685	686	686	687	687	687	686	686	685			
10	671	669	668	667	668	669	671	673	675	677	677	678	677	677	676	674			
15	651	649	647	646	646	648	651	654	658	660	661	661	661	660	658	656			
20	626	622	619	618	619	621	625	629	634	636	637	638	637	636	634	631			
25	594	589	586	584	585	589	593	598	604	606	608	608	608	606	604	600			
30	557	552	548	546	547	551	557	562	569	571	573	573	572	571	569	565			
35	517	511	506	504	505	510	516	522	529	532	533	533	533	531	529	524			
40	472	466	460	458	460	464	471	478	485	489	490	490	489	488	485	481			
45	425	418	413	410	412	417	424	431	439	442	443	444	443	441	439	434			
50	375	368	363	361	362	367	374	382	390	393	395	395	394	393	390	385			
55	324	317	311	309	310	315	322	330	339	342	344	344	344	342	338	333			
60	271	264	259	257	258	263	269	277	285	289	292	292	292	289	286	280			
65	217	210	206	204	205	209	216	223	231	236	239	240	239	236	232	226			
70	164	157	153	152	153	157	162	169	178	182	185	187	186	183	178	173			
75	112	106	103	101	102	106	111	117	125	130	133	135	134	131	126	120			
80	63.8	59.6	56.4	54.7	56.1	59.2	63.2	67.9	75.7	80.6	83.8	85.1	84.4	81.8	77.2	71.3			
85	21.8	18.3	16.2	14.4	15.4	17.7	21.4	25.4	32.1	36.5	39.5	40.3	39.9	37.7	33.5	28.1			
90	0.01	0.00	0.00	0.00	0.00	0.00	0.09	0.09	1.16	2.54	3.84	4.46	4.13	3.03	1.73	0.36			
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
170	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

C Range: 0 - 360DEG
 C Interval: 22.5DEG
 Test Speed: HIGH
 Temperature:24.3DEG
 Operators:David
 Test Date:2013-04-07

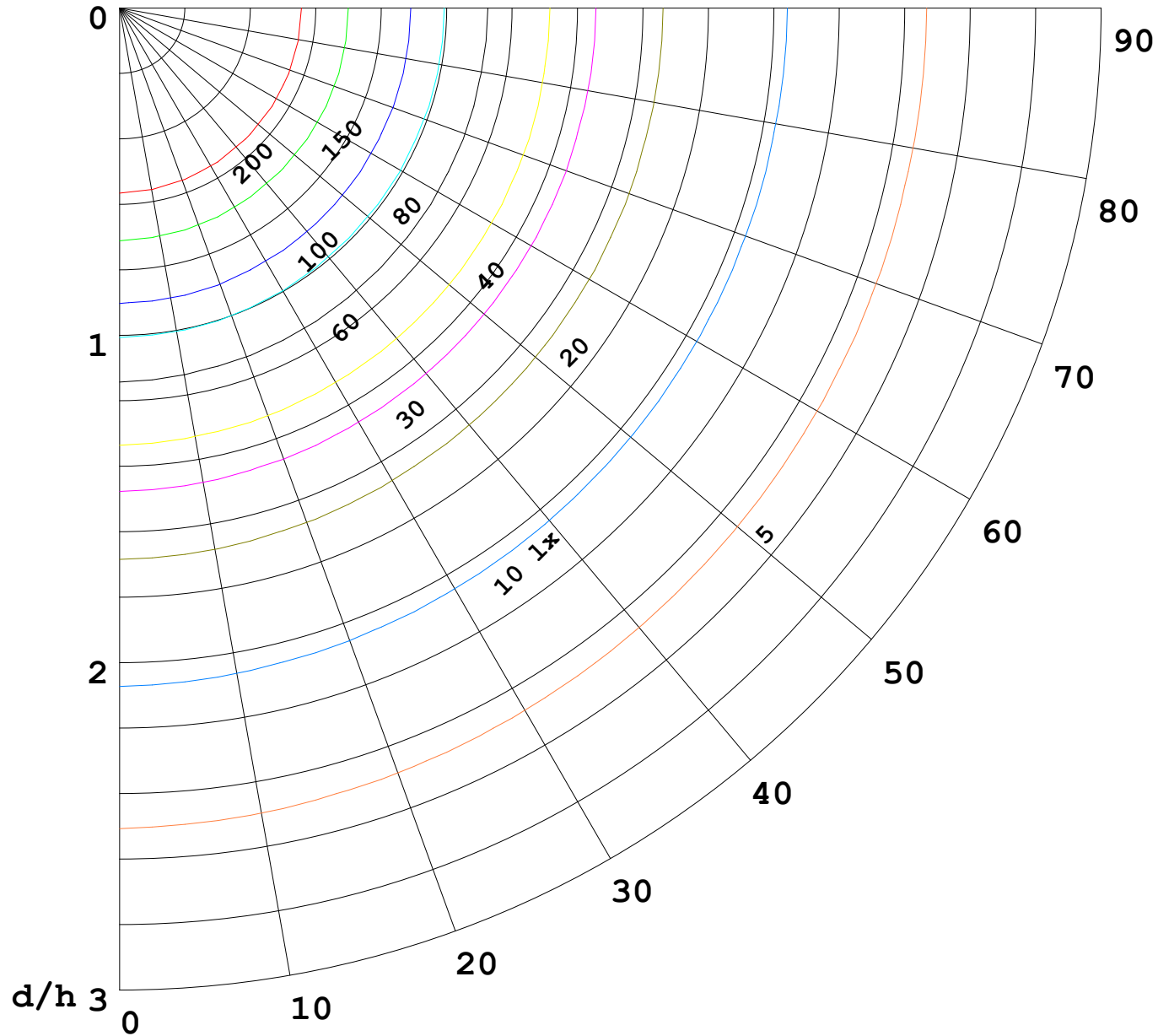
γ Range: 0 - 180DEG
 γ Interval: 1.0DEG
 Test System:EVERFINE GO-R5000_V2 SYSTEM V2.0.265
 Humidity:46.4%
 Test Distance:2.420m [K=1.0000]
 Remarks:

I (cd)



1000 lm

$K = 1$



F = 5000 lm
K = 0.7
Hcc = 0.0 m
Hfc = 0.0 m
Eave = 100 lx

	Pcc	Pw	Pfc
—————	70	50	30
—————	50	30	20

